

# Tear String Opening System for Flexible Container

## FIELD OF THE INVENTION:

The present invention relates to opening systems for flexible containers, specifically to opening systems that allow a container to be opened easily without the use of a secondary cutting implement. The invention also relates to the method of making such opening systems and the apparatus utilized in carrying out such method.

## BACKGROUND OF THE INVENTION:

Flexible containers, such as bags for food products and the like must be tightly closed during storage, shipping and handling. Once delivered to the end user, the container must be opened to remove the contents. It is therefore advantageous for a container to provide secure containment while also being able to be easily opened without the need for cutting implements or complicated procedures.

Containers that are designed to open without cutting tools typically incorporate a tear string or a tear strip which is designed to tear along a predetermined path. In many of these systems, a tear string is incorporated into the plastic coated layer which is typically located on the inside side of the container construction material. Patents #4,629,071, #4,650,079, and #5,375,930 all issued to Tani and patent #3,276,669 issued to Vilutis, describe opening systems that include a tear string heat sealed or fused to the plastic coated layer located on the inside side of the container construction material. These containers are typically made of a frangible material that allows the string to tear through the material thereby providing access to the contents. However, in instances wherein the container materials are less frangible or wherein the container is made of multiple layer materials that have different tear characteristics, more elaborate tear string systems have been incorporated to control the direction of the tear. Patents #4,795,035, #5,035,328 and #5,035,329 all issued to Kim, include tear guides incorporated into the design which help to control the direction of the tear. Patent #5,203,634 issued to Kim incorporates additional tear guides located on both sides of the container construction material to further direct the path of the tear strip. Patent #3,057,539 issued to Leary describes a tear string laminated into the plastic coating applied to the inside layer of the container construction material, or, between one layer of a paper based material and a layer of a foil based material. The specification describes an opening sequence wherein the tear string will tear only the layer(s) above the string, leaving either the plastic coating or the plastic coating and a layer of foil material left on the container that may require opening through a secondary action. The described system will work only with container construction materials that include a thin, frangible layer or layers that remain in place after the

tear string is removed. A major limitation with this design will be evident if the system is employed in a container that incorporates a stronger construction material that would be left in place after the tear string is removed, in which case, a more positive opening system must be included to allow complete opening of the container.

Patent #4,773,541 issued to Riddell, patent #5,135,790 issued to Kaplan, patent #5,836,697 issued to Chiesa and patent #6,354,739 issued to Sheehan describe tape based designs wherein a portion of a tape material along with a section of the container is removed to provide an opening system for a flexible container. Patent #6,060,095 issued to Scrimager discloses an opening system wherein a section of the face portion of a bag tears out along a double set of weakened lines to provide access to the contents.

Although the structures previously defined perform the opening functions for which they were designed, the described systems typically complicate the container manufacturing process due to the multiple opening elements involved. In addition, the systems may be ineffective when used with difficult to tear materials such as multiple layer material, or, in situations wherein the container is used in a heated environment such as a microwave oven, the string and/or other opening components may delaminate from the inside of the container construction material. In other applications, the adhesive or laminating materials used to bond the tear string to the container construction material may be inappropriate, especially in cases wherein the container is to be used with food products. What has not been shown in the prior art is an opening system that can safely and effectively open a container while being simple and inexpensive to manufacture.

#### **BRIEF SUMMARY OF THE INVENTION:**

The object of the present invention is to provide an end user with a novel and efficient means of opening a container while also providing an opening system that can be produced at low cost. The invention describes a container opening system made of composite material which includes a tear string located between two or more material layers, the tear string running in the same direction and in close proximity to a line of weakness which is provided in the lower layer. (To clarify the position of the layers, the lower layer will represent the layer located closest to the inside of the container while the upper layer will represent the layer toward the outside of the container). The system allows the string to tear through the upper, unweakened layer while leaving the weakened lower layer in place. The user will then open the weakened lower layer in a secondary action to fully open the container.

The opening system is included in a composite material which comprises two or more layers, a tear string being inserted between the layers during a lamination process, with the lower layer being weakened in a line running in the same direction and aligned with the path of the tear string. By placing the tear string between

the layers, the tear string will need only to create a cutting path in the upper layer and will tend to tear in a straight line due to the adherence of the layers to each other. In effect, the strength of the bond between the layers will be greater than the resistance of the upper layer to being torn by the tear string, thereby allowing the tear string to cut through the upper layer in a relatively straight line while leaving the lower layer basically intact. As described herein, the line of weakness in the lower layer would include an area in the layer that has been perforated, cut or otherwise weakened through pressure, heat or other means that would establish a line considerably weaker than the area adjacent to it.

The tear string opening system could be incorporated into a flexible container in several ways. In a preferred embodiment, the tear string opening system will be incorporated directly into a composite container construction material, being a part of the container thereof. In a secondary embodiment, it may be advantageous to limit the width of the upper or lower layers, allowing one of the layers to cover only a portion of the other corresponding layer of the container. In an additional secondary embodiment, the opening system could be provided as a composite tape-like system which could be bonded to the inside of the container material in the event the container is made of a frangible material, or the tape like material including the tear string could be applied between two separate parts of the container at a seam between two sections. With this embodiment, the tape like material including the tear string would include an adhesive or other bonding agent applied to the top or bottom of the composite material which would allow the composite material to be bonded to the container construction material.

Construction of the tear string opening system will comprise; two or more supply rolls of material which will represent the upper and lower layers, the lower layer passing a device which will create a line of weakness in the layer, adhesive means combining the layers being applied, and a tear string inserted in close proximity and aligned with the line of weakness. In so doing, the end product will comprise a multiple layer material having a tear string located between the layers and in close proximity and aligned with the line of weakness located in the lower layer. The material can be coiled onto rolls and stored for use in container production at a later date or in a preferred embodiment, the multiple layer material can be directly utilized in the construction of a container. With this second, preferred embodiment, the lamination of the material and the manufacture of a container are produced in-line, in a production sequence.

The invention improves the art over previous opening devices by providing an effective opening system for a container while requiring minimal additional cost, that cost being only the additional cost of a tear string. By so doing, the invention will represent a considerable cost advantage over other elaborate container opening systems. The invention describes an opening system for a container which includes a tear string

incorporated between two or more layers of material and wherein the lower layer features a line of weakness in close proximity to the position of the tear string.

#### **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS:**

- FIG 1 Shows a perspective and exploded view of the construction material layers including a weakened line in the lower layer and a tear string located between the two layers.
- FIG 2 Shows a perspective view of the opening system with the construction material layers bonded together and showing the position of a tear string in relation to the weakened line and including the position of a pull tab
- FIG 3 Shows an end on view of the composite construction material with the position of a tear string in relation to the weakened line.
- FIG 4 Shows the opening system material in the action of being opened, with the upper layer tearing open while the lower layer including the weakened line remains relatively intact.
- FIG 5 Shows the lower layer being burst after the upper layer is opened
- FIG 6 Shows a production technique including rolls of construction material, a device for creating a weakened line and a tear string being inserted during manufacture.

#### **DETAILED DESCRIPTION OF THE INVENTION:**

As best shown in FIG 1, FIG 2 and FIG 3, composite construction material A includes lower layer 10, upper layer 11, and tear string 30. Tear string 30 is positioned between the layers with the tear string located in close proximity to a line of weakness 40 featured in lower layer 10. For descriptive purposes, upper layer 11 will herein be designated as representing the layer that will ultimately be featured toward the outside of the container, while lower layer 10 will represent the layer that will ultimately be featured toward the inside of the container. Lower layer 10 and upper layer 11 are bonded together using adhesive material 25, with tear string 30 located within the adhesive material. By locating the tear string within the adhesive material, the tear string will be held in place so that it will preferentially tear through the upper layer and resist pulling out from between the layers. Lower layer 10 includes line of weakness 40 which is positioned in close proximity and aligned with tear string 30. The line of weakness comprises a series of perforations, a cut line, a score line, or other type of weakness created through heat, pressure or other means. The perforated line shown in the drawings is for illustrative purposes only and should not be considered a limiting embodiment. Also, adhesive material 25 could be substituted with the use of layers of construction material which could be bonded together through heat, radio waves or any other type of adhesion without deviating from the scope of the invention.

In a preferred embodiment, and as best shown in FIG 2 and FIG 4, the end user will instigate the tear by pulling upwards on pull tab 60 which is cut into composite construction material A and will be located at one or both ends of the container. Pull tab 60 will include cuts made through upper layer 11, lower layer 10 or completely through composite construction material A starting from an end of the container and are preferably arced or angled toward tear string 30 without cutting through the tear string. By lifting pull tab 60, the tab portion of composite construction material A will initially tear in a direction toward tear string 30, and, being adhered to tear string 30, enable the tear string to tear through the upper layer of the composite construction material starting from the tab end of the container and continuing to the other end of the container. As best shown in FIG 4, lower layer 10 will preferably separate from pull tab 60 and remain in place while tear string 30 is pulled through upper layer 11. As best shown in FIG 5, after the tear string is pulled through the upper layer from one end of the container to the other, the lower layer is opened along line of weakness 40 thereby completing the opening of the container. In a preferred but not limiting embodiment, opening the lower layer could be described as being a 'bursting' action.

FIG 6 describes the sequence for producing the composite construction material which includes: supply roll 81 of upper layer material 11, supply roll 80 of lower layer material 10, adhesive application apparatus 90, device 99 which creates a line of weakness in lower layer 11, supply roll 70 of tear string 30 and roller devices 95 & 96 which compress the materials and the string into composite construction material A. As the construction material layers travel from their respective supply rolls, lower layer 10 is perforated or otherwise weakened by device 99 in a line running longitudinally with the material, adhesive 25 is applied through application apparatus 90, tear string 30 is inserted adjacent to the weakened area 40 in the lower layer and the assembly of materials is compressed by rollers 95 & 96 into composite construction material A. It should be understood at this point that additional layers of material could be included and that each material used for the upper and lower layers could further consist of multiple layer material without deviating from the scope of the invention. It should also be understood that the positioning of the material rolls is arbitrary and that any sequence that would create the described composite construction material could be utilized.

The aforementioned description includes various details and particular features according to preferred embodiments of the present invention, however, it is to be understood that this is for illustrative purposes only. Various modifications and adaptations may become apparent to those of ordinary skill in the art without departing from the spirit and scope of the present invention. For example, when describing layers it is understood that the construction material may contain two or more primary layers along with one or more coating layers, with the tear string located in a position between the layers that will be the most effective in tearing through the layer(s) directly above it. The spirit of the invention is to provide a tear string in an appropriate position between construction material layers which will allow the tear string to tear through the

upper layer or layers, while featuring a line of weakness which is located in the lower layer or layers in the area of the tear string, the function of which is to allow the upper layer(s) to be opened by the tear string while the lower layer(s) will open through a secondary action. It should also be understood that the term 'tear string' could include a cord, twine, plastic tear strip, wire or other materials that would create a relatively straight, sharp cut in the upper layer. For purposes of clarity, the term tear string is intended to mean the above mentioned alternatives without deviating from the scope of the invention.

### **Reference Numerals in Drawings**

- A Composite construction material
- 10 Lower layer material
- 11 Upper layer material
- 25 Adhesive material
- 30 Tear string
- 40 Weakened line
- 60 Pull tab area
- 70 Tear string supply roll
- 80 Lower layer supply roll
- 81 Upper layer supply roll
- 90 Adhesive application apparatus
- 95 Compression roller
- 96 Compression roller
- 99 Device that creates line of weakness in lower layer